

CLAIMS

1. An antenna device comprising:
  - a substrate;
  - a conductor film which is disposed on a portion of the substrate;
  - a feed point disposed on the substrate;
  - a loading section disposed on the substrate and constructed with a line-shaped conductor pattern which is formed in a longitudinal direction of an elementary body made of a dielectric material;
  - an inductor section which connects one end of the conductor pattern to the conductive film; and
  - a feed point which feeds a current to a connection point of the one end of the conductor pattern and the inductor section,  
wherein a longitudinal direction of the loading section is arranged to be parallel to an edge side of the conductor film.
2. The antenna device according to Claim 1, wherein a capacitor section is connected between the connection point and the feed section.
3. The antenna device according to Claim 1 or 2,

wherein the loading section includes a concentrated constant element.

4. The antenna device according to any one of Claims 1 to 3, wherein a line-shaped meander pattern is connected to the other end of the conductor pattern.

5. The antenna device according to any one of Claims 1 to 4, wherein the capacitor section includes a capacitor section which is constructed with a pair of planar electrodes formed on the elementary body to face each other.

6. The antenna device according to Claim 5, wherein one of a pair of the planar electrodes is disposed on a surface of the elementary body and can be trimmed.

7. The antenna device according to any one of Claims 1 to 6, wherein a multiple-resonance capacitor section is equivalently serially connected between two different points of the conductor pattern.

8. The antenna device according to any one of Claims 1 to 7, wherein the conductor pattern is wound around the elementary body in a longitudinal direction thereof in a helical shape.

9. The antenna device according to any one of Claims 1 to 7, wherein the conductor pattern is formed on a surface of the elementary body in a meander shape.

10. An antenna device comprising:  
a substrate;  
a conductor film which is formed to extend in one direction on a surface of the substrate;  
first and second loading sections which are disposed to be separated from the conductor film on the substrate and constructed by forming a line-shaped conductor pattern on an elementary body made of a dielectric material, a magnetic material, or a complex material having dielectric and magnetic properties;  
an inductor section which is connected between one end of the conductor pattern and the conductor film; and  
a feed section which feeds a current to a connection point of the one end of the conductor pattern and the inductor section,  
wherein a first resonance frequency is set by the first loading section, the inductor section, and the feed section, and a second resonance frequency is set by the second loading section, the inductor section, and the feed section.

11. The antenna device according to Claim 10, wherein any one or both of the first and second loading sections includes a concentrated constant element.

12. The antenna device according to Claim 10 or 11, wherein a line-shaped meander pattern is connected to the other end of the conductor pattern.

13. The antenna device according to Claim 10 or 11, wherein an extension member is connected to the other end of the conductor pattern.

14. The antenna device according to Claim 12, wherein an extension member is connected to a front end of the meander pattern.

15. The antenna device according to any one of Claims 10 to 14, wherein an impedance adjusting section is connected between the connection point and the feed section.

16. The antenna device according to any one of Claims 10 to 15, wherein the conductor pattern is wound around the elementary body in a longitudinal direction thereof in a helical shape.

17. The antenna device according to any one of Claims 10 to 15, wherein the conductor pattern is formed on a surface of the elementary body in a meander shape.

18. A communication apparatus comprising:  
a case; and  
a communication control circuit which is disposed in an inner portion of the case; and  
an antenna device which is connected to the communication control circuit,  
wherein the case includes a case body and an antenna receiving portion which is disposed to extend from one side wall of the case body outward,  
wherein the antenna device includes:  
a substantially L-shaped substrate which has a first substrate portion extending in one direction and a second substrate portion curved from the first substrate portion and extending toward a lateral direction of the first substrate portion;  
a ground connection portion which is disposed on the substrate and connected to a ground of the communication control circuit;  
a first loading section which is disposed on the first substrate portion and constructed by forming a line-shaped conductor pattern on an elementary body made of a dielectric

material, a magnetic material, or a complex material having dielectric and magnetic properties;

a second loading section which is disposed on the second substrate portion and constructed by forming a line-shaped conductor pattern on an elementary body made of a dielectric material, a magnetic material, or a complex material having dielectric and magnetic properties;

an inductor section which connects ends of the first and second loading sections to the ground connection portion; and

a feed section which is connected to the communication control circuit and feeds a current to a connection point of the ends of the first and second loading section and the inductor section, and

wherein any one of the first substrate portion provided with the first loading section and the second substrate portion provided with the second loading section are disposed in the antenna receiving portion, and the other is disposed along an inner surface of the one side wall.

19. The communication apparatus according to Claim 18, wherein the antenna device includes a concentrated constant element provided to any one or both of the first and second loading sections.

20. The communication apparatus according to Claim 18 or 19, wherein the antenna device includes an impedance adjusting section which is connected between the connection point and the feed section.

21. The communication apparatus according to any one of Claims 18 to 20, wherein the conductor pattern is wound around the elementary body in a longitudinal direction thereof in a helical shape.

22. The communication apparatus according to any one of Claims 18 to 20, wherein the conductor pattern is formed on a surface of the elementary body in a meander shape.